Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A head-related transfer function model for use with 3D sound applications, comprising:

a plurality of Eigen filters;

a plurality of spatial characteristic functions derived from head-related transfer functions and adaptively combined with said plurality of Eigen filters; and

a plurality of regularizing models adapted to respectively regularize said plurality of spatial characteristic functions prior to said respective combination with said plurality of Eigen filters to provide a plurality of head related transfer functions with varying degrees of smoothness.

2. (previously presented) The head-related transfer function model for use with 3D sound applications according to claim 1, further comprising:

a summer operably coupled to said plurality of combined Eigen filters combined with said plurality of regularized spatial characteristic functions to provide said head-related transfer function model.

3. (previously presented) The head-related transfer function model for use with 3D sound applications according to claim 1, wherein:

said plurality of regularizing models are each adapted to perform a generalized spline model.

4. (previously presented) The head-related transfer function model for use with 3D sound applications according to claim 1, further comprising:

a smoothness control operably coupled with said plurality of regularizing models to allow control of a trade-off between localization and smoothness of said head-related transfer function.

5. (currently amended) A head-related impulse response model for use with 3D sound applications, comprising:

a plurality of Eigen filters;

a plurality of spatial characteristic functions derived from head-related impulse responses and adapted to be respectively combined with said plurality of Eigen filters;

a plurality of regularizing models adapted to respectively regularize said plurality of spatial characteristic functions prior to said respective combination with said plurality of Eigen filters; and

a single regularized head-related transfer function filter produced by summing said Eigen filters and said regularized spatial characteristic functions.

6. (previously presented) The head-related impulse response model for use with 3D sound applications according to claim 5, further comprising:

a summer adapted to sum said plurality of combined Eigen filters combined with said plurality of regularized spatial characteristic functions to provide said head-related impulse response model.

7. (previously presented) The head-related impulse response model for use with 3D sound applications according to claim 5, wherein:

said plurality of regularizing models are each adapted to perform a generalized spline model.

8. (previously presented) The head-related transfer function model for use with 3D sound applications according to claim 5, further comprising:

a smoothness control in communication with said plurality of regularizing models to allow control of a trade-off between localization and smoothness of said head-related transfer function.

9. (currently amended) A method of determining spatial characteristic sets for use in a head-related transfer function model, comprising:

constructing a covariance data matrix of a plurality of measured head-related transfer functions;

performing an Eigen decomposition of said covariance data matrix to provide a plurality of Eigen vectors;

determining at least one principal Eigen vector from said plurality of Eigen vectors;

projecting said measured head-related transfer functions back to said at least one principal Eigen vector to create said spatial characteristic sets; and

respectively regularizing said spatial characteristic sets by a plurality of regularizing models prior to being combined with a plurality of Eigen filters to provide a plurality of regularized head-related transfer functions with varying degrees of smoothness.

10. (currently amended) A method of determining spatial characteristic sets for use in a head-related impulse response model, comprising:

constructing a covariance data matrix of a plurality of measured head-related impulse responses;

performing an Eigen decomposition of said time domain covariance data matrix to provide a plurality of Eigen vectors;

determining at least one principal Eigen vector from said plurality of Eigen vectors;

back-projecting said measured head-related impulse responses to said at least one principal Eigen vector to create said spatial characteristic sets; and

respectively regularizing said spatial characteristic sets by a plurality of regularizing models prior to being combined with a plurality of Eigen filters to provide a plurality of regularized head-related impulse responses with varying degrees of smoothness.

11. (currently amended) Apparatus for determining spatial characteristic sets for use in a head-related transfer function model, comprising:

means for constructing a covariance data matrix of a plurality of measured head-related transfer functions;

means for performing an Eigen decomposition of said covariance data matrix to provide a plurality of Eigen vectors;

means for determining at least one principal Eigen vector from said plurality of Eigen vectors; and

means for back-projecting said measured head-related transfer functions to said at least one principal Eigen vector to create said spatial characteristic sets; and

means for respectively regularizing said spatial characteristic sets by a plurality of regularizing models prior to being combined with a plurality of Eigen filters to provide a plurality of regularized HRTFs with varying degrees of smoothness.

12. (currently amended) Apparatus for determining spatial characteristic sets for use in a head-related impulse response model, comprising:

means for constructing a covariance data matrix of a plurality of measured head-related impulse responses;

means for performing an Eigen decomposition of said time domain covariance data matrix to provide a plurality of Eigen vectors;

means for determining at least one principal Eigen vector from said plurality of Eigen vectors;

means for back-projecting said measured head-related impulse responses to said at least one principal Eigen vector to create said spatial characteristic sets; and

means for respectively regularizing said spatial characteristic sets by a plurality of regularizing models prior to being combined with a plurality of Eigen filters to provide a plurality of regularized head-related impulse responses with varying degrees of smoothness.